

PATENT**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE****In re Application of:****GREGG M. SKLEDAR
KENNETH D. HOPE****Serial No.: 09/343,334****Filed: June 30, 1999****For: POLYALPHAOLEFINS WITH IMPROVED
OXIDATIVE STABILITY AND THE
PROCESS OF MAKING THEREOF****Group Art Unit: 1764****Examiner: Jerry D. Johnson****Attorney Docket: 2039.010700/RFE****CUSTOMER NO. 37774****DECLARATION UNDER 37 C.F.R. § 1.132 OF KENNETH D. HOPE****I, KENNETH D. HOPE, declare as follows:**

1. I am a coinventor of the present application. As part of my work relating to this application, I revised the ASTM D 2710 standard for measuring the Bromine Index of petroleum hydrocarbons, such as cumenes, reformates, and kerosenes, to better measure the degree of unsaturation of polyalphaolefins.
2. I hold a B.S. in Chemistry from The University of Montevallo and a Ph.D. in Physical Chemistry from The University of Alabama at Birmingham. I have been employed by Chevron Phillips Chemical Company LP, or its predecessor, Chevron Chemical Company, from July 1991 to the present. In that time, one of the things I have worked on is development of polyalphaolefin compositions and methods of preparing and improving them.
3. I understand that the Examiner of the present application has rejected claims 13-24 as allegedly being unpatentable over Sauer, U.S. Pat. No. 3,113,167

("Sauer"), Cupples et al., U.S. Pat. No. 4,282,392 ("Cupples"), or Wu et al., U.S. Pat. No. 5,276,227 ("Wu"). The Examiner has pointed to a passage in Sauer that alleges Sauer performed "complete hydrogenation" of a polyalphaolefin (col. 6, lines 13-15); a passage in Cupples that alleges Cupples teaches hydrogenation of a polyalphaolefin by "intimate contact of the total liquid oligomer with the catalyst for a substantial period of time" (col. 1, lines 11-16); and a passage in Wu that alleges Wu generated polyalphaolefins with "low unsaturation, as characterized by low bromine number usually lower than 4" (col. 3, lines 47-57).

4. According to my knowledge and belief, polyalphaolefins (PAOs) are quite difficult to hydrogenate due to the high degree of branching when they are produced from certain Lewis Acid catalysts, specifically boron trifluoride. This high degree of branching of PAOs sterically hinders the accessibility of carbon-carbon double bonds to hydrogenation, as well as other reactions. For many years, PAOs have been hydrogenated (*i.e.*, undergone an increase in their degree of saturation and a lowering of their Bromine Index values) to improve the oxidative stability of the end products. PAOs are known for their oxidative stability and this is a key reason for their use in the lubricants market. However, interest remains in producing PAOs with greater oxidative stability.

5. Also according to my knowledge and belief, prior art techniques for measuring the degree of unsaturation or hydrogenation of PAOs had both poor accuracy and poor repeatability. The aforementioned unmodified ASTM D 2710 standard has been widely used in the prior art, but has not avoided the problems with accuracy and repeatability stated above. The unmodified ASTM D 2710 method was not originally

designed for highly branched, viscous oils like PAOs which are poorly miscible in the titration solvent. It is well known that reactions (like the Bromine Index titration) suffer from inefficiencies when the reactants are not in solution. This is one of the main reasons for the modification of the Bromine Index method. I have observed PAO samples which, according to ASTM D 2710, have apparent Bromine Index values less than 200 mg Bromine per 100 g PAO, but which, upon measurements using the improved technique designated K801, having more accurate Bromine Index values much greater than 200 mg Bromine per 100 g PAO.

6. For an example of such a PAO sample, see the present specification, Example 11, pp. 15-16. According to a conversation between Gunsel and me, previous workers of mine at Chevron Chemical Company both provided Gunsel with Fluid B and measured its apparent Bromine Index, according to unmodified ASTM D 2710, as 2 mg Br per 100 g PAO. For the reasons discussed in Example 11 of the specification and paragraphs 4-6 of this declaration, I conclude the Fluid B of Gunsel had a more accurate Bromine Index value, as measured by our modified assay, of at least about 433 mg Br per 100 g PAO.

7. Given the above two points, it is my opinion that the saturation assays of Sauer, Cupples, and Wu are highly unlikely to yield accurate measurements of the degree of unsaturation of PAOs for low Bromine Index numbers. As a further point in favor of this conclusion, given that Sauer, Cupples, and Wu filed their patent applications in the era 1962-1992, if any of the three groups of workers had truly generated PAOs hydrogenated to the levels recited by the present claims, they would have noted the substantial increase in oxidative stability, observed the correlation between low bromine

index values and oxidative stability that had not been previously made (see Gunsel), and would likely have commercialized those products. To the best of my knowledge, no other entities working in this field have done so.

8. Furthermore, Chevron Chemical Company has historically produced PAOs by the Cupples process. Our reduction to practice of the present invention required additional equipment and process modifications to obtain the claimed products. This further supports the conclusion that Cupples did not generate PAOs with more accurate Bromine Index values in the presently claimed ranges.

9. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 6/7/04


Kenneth D. Hope
KENNETH D. HOPE